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Prevalence of dermatophyte fungal infection in Hillah, Iraq

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Abstract : The present study was designed to determine the prevalence of superficial fungal infections among the patients that were living in different circumstances in Hilla region, Iraq. From October 2012 to March 2013.200 patients with ages(1-76 years) were surveyed and examined for dermatophyte fungal infections by utilizing microscopy and culture predicated laboratory diagnostic methods.

The results revealed that 65% of the patients were infected with skin lesions followed by nail lesions (22.5%) and scalp lesions (12.5%). The prevalence rates of dermatophyte fungal infections were linked to the types of tinea infections, including tinea corporis (14.5%), tinea pedis (6%), tinea capitis (12.5%), tinea ungium (22.5%), tinea cruris (22.5%), tinea faciei (4%), pityriasis versicolor (27.5%) and tinea manuum (1%).

The proportion of fungal infection in rural area was more preponderant in comparison to urban areas. Concretely, in terms of percentages, the cases of tinea ungium, tinea corporis, pityriasis versicolor, tinea faciei were 20.83%, 14.58%, 15.62 %, and 8.34% higher in rural areas, respectively. Furthermore, the rate of percent infection by tinea pedis (8.25 %), tinea capitis (18.3%), tinea cruris (12.04%), Pityriasis versicolor (27.25%), tinea barbea (4.25%) and tinea incognito (4.58 %) were higher in male whereas the percentage of tinea ungium (38.46%) and tinea faciei (6.59%) infections were highest in female. In addition, study demonstrated that indices of tinea infection has been significantly associated with age.This study suggested there has been an exigent need to ameliorate the edification and morel culture values of peoples in addition to increment the economic condition of the society.

Keywords : Dermatophytes, fungal infection, living conditions.

Introduction:

Nowadays, fungal infections of the skin, hairs and nails have become a common ecumenical quandary. Blanka, *et al*, 2008 (1) reported that 20–25% of the world's population has skin mycoses and appeared to be a frequent form of infection. These infections are being apperceived as a major public health quandary worldwide (2). Generally, dermatophyte infections are considered as superficial, but immunocompromised patients can experience astringent symptoms and can become a sources of disease dissemination (3). However, dermatophytosis is not responsible to cause mortality but it is a kind of assiduous and painful disease. It has been documented that millions of dollars are being consumed every year in the treatment of dematophytosis (4).

According to habitat, dermatophyte fungi are grouped into anthropophilic (human associated), zoophilic (animal associated) and geophilic (soil dwelling). These fungi are kenned to be abundant in soils and responsible to decay hair feathers, fur, horns and other keratinous structures. It has also been documented that zoophilic fungi can cause infection to humans whereas anthropophilic may infect animals (5).

In additament to anamorphic relegation (*Epidermophyton*, *Microsporum* and *Trichophyton*) dermatophyte can also be identified by utilizing clinical features, culture characteristics, microscopic morphology, physiological characteristics and nutritional requisites (6, 7). Evidences suggested that dermatophyte fungi are one among the categories of competent parasitic associates of humans due to their competency to invade keratinized tissues (8). So far, prevalence of dermatophyte fungal infections has been studied in different parts of the world (8,9). Particularly in Iraq, dermatophytosis is found to be highly infectious disease and considered as a solemn public health quandary. Al-Mendalawi and Ibrahim, 2012 (10) studied the prevalence of dermatoses among the Iraqis childrens and presented the data as followings: infectious (32.3%), eczematous (20.8%), pigmentary (17.8%), papulosquamous (14.2%), drug-induced (4.5%), alimental deficiency (1.8%) and sundry (8.6%).

In recent years, cases of dermatophyte fungal infections have incremented in Iraq that stimulated the scientific community to come forward so as to make people cognizant of it. Consequently it is essential to view the perspectives and insight of prevalence of dermatophyte fungal infection in Babylon Province, Iraq. Taking into consideration, present study demonstrated the correlation of gender, age, place of residence (rural or urban), health history of the individual, marital status, and the nature of work practiced by the patient on dermatophyte infection.

Material and Method:

Collection of specimens:

A sample size of two hundred were collected from the patients who have attended the dermatology unit- at Merjan Edifying Hospital, Al-Hilla City, Babylon Province between 1 October 2012 to 31 March 2013. The association of frequency of dermatophytoses infection to the individual were investigated in terms of following aspects: gender; age; personal hygiene; place of residence (rural or urban); health history of the individual; marital status and the nature of work practiced. While collecting the samples, if patients have applied any cream or other local agents that was removed initially with 70% ethanol followed by the utilization of blunt scalpel and tweezers. Furthermore the lesion was firmly scraped particularly at the advancing border. If multiple lesions were present then the most recent one was culled for scraping as old loose scales is often found to be unsatisfactory. All the skin samples were of epidermal scales and collected from the advancing edges of the lesions. Samples of hairs including roots were plucked whereas the samples of nails were taken by scraping or trimming of the whole nail's end. According to Kwon-Chung, and Beneet (1992) (11), the collected samples were kept in a dry envelope and transported by utilizing a hard paper container. During Packaging and conveyance, all the norms of biohazard regulations were followed.

Diagnosis

Diagnosis was made according to the diagnostic criteria listed by Gupta *et al*, 2000 (12) in terms of patient's history and clinical examination.

Direct examination of specimens:

The hair, nails and skin specimens were examined by utilizing the methods of Koneman *et a*., 1978 (13). For direct microscopy of hairs and skin, specimens were mounted in 10% KOH whereas the nails specimens were examined after treating with 20% KOH for 24 hours before examination. The prepared glass slide was gently heated for twice to three times on flame followed by incubation of 30 minutes at room temperature. Then fungal structures were examined with microscopic lenses of potency 40X and 100X. In cases of negative results, examination was reiterated twice. Lactophenol Cotton Blue was utilized for identifying the fungal structures.

Fungal Culturing

Sabourauds dextrose agar plates were inoculated with fungal specimens. Chloramphenicol at a concentration of 0.05 g/ml was integrated to obviate bacterial magnification into the medium. These plates were incubated at 28 oC and examined twice in a week for perpetually up to 5 weeks. Distinguishing features of the fungal specimens were analyzed according to the instructions of Rippon, 1988 (14).

Statistical Analysis

To analyze the data statistically, Anova was implemented by utilizing genestate 14th edition program. Means of the results were compared to determine the significance distinction between the different treatments assays by using (5 %) LSD test.

Results and Discussion

Clinical diagnosis:

Out of 200 samples, results showed that dermatophyte fungal infections were comprised from the followings regions: scalp lesions (25), nail lesions (45), and skin lesions (130). Infections appeared from sundry forms of fungus including Tinea manuum (Plate 1), Tinea faciei (Plate 2a and b), Tinea incognito (Plate 3), Tinea pedis (Plate 4), Tinea ungium (Plate 5), Tinea barbae (plate 6), Tinea corporis (Plate 7a, b & c), Tinea cruris (Plate 8), Tinea versicolor (Plate 9) and Tinea capitis (Plate 10).

Plate 1: Tinea mannum, erythematous patch effecting the thenar aspect of palm and flex or surface of index finger of the hand.

Plate 2a:Tinea faciei, erythmatous lesion with multiple pustules affecting the chin

Plate 2b: Tinea faciei, annular or circinate patch with clear center and active in the periphery affected the face and upper part of the neck.

Plate 3: Tinea incognito, annular lesion which revealed some activity at the periphery. The center was not completely cleared, but have some pustules within the centers that affecting the flexor aspect of the fore arm

Plate 4:Tinea pedis, scales with exfoliation involving theplanar surface of fore foot and toes.

Plate 5: Tinea ungium, onycholysis with yellowish discoloration of distal parts of nail plates

Plate 6:Tinea barbea, erythmatos plaque with multiple pustules involving beard region

Plate 7:Tinea corporis, circinate or annular patch with clearance in the center and active in margin affecting the thigh above knee joint.Another similar but smaller lesion at site of the knee joint

Plate 8:Tinea cruris,Erythematous patch with active borders involving the inner surface of thigh

Plate 9:Tinea versicolor, multiple brown macules with fine and brawny scales affecting the flexor surface of the arm

Plate 10: Tinea capitis,boggy like swelling with many pustules affecting the scalp

(Krrion type)

The prevalence of dermatophyte fungal infections rates in patients with respect to tinea types

The prevalence rates of dermatophyte fungal infections with veneration to Tinea types (figure 1) involved: Tinea corporis (14.50%), Tinea pedis (6%), Tinea capitis (12.5%), Tinea ungium (22.5%), Tinea cruris (6%), Tinea faciei (4%), Tinea versicolor (27.5%), Tinea circinata (2%), Tinea barbae (2.5%) and Tinea incognito (2.5%).

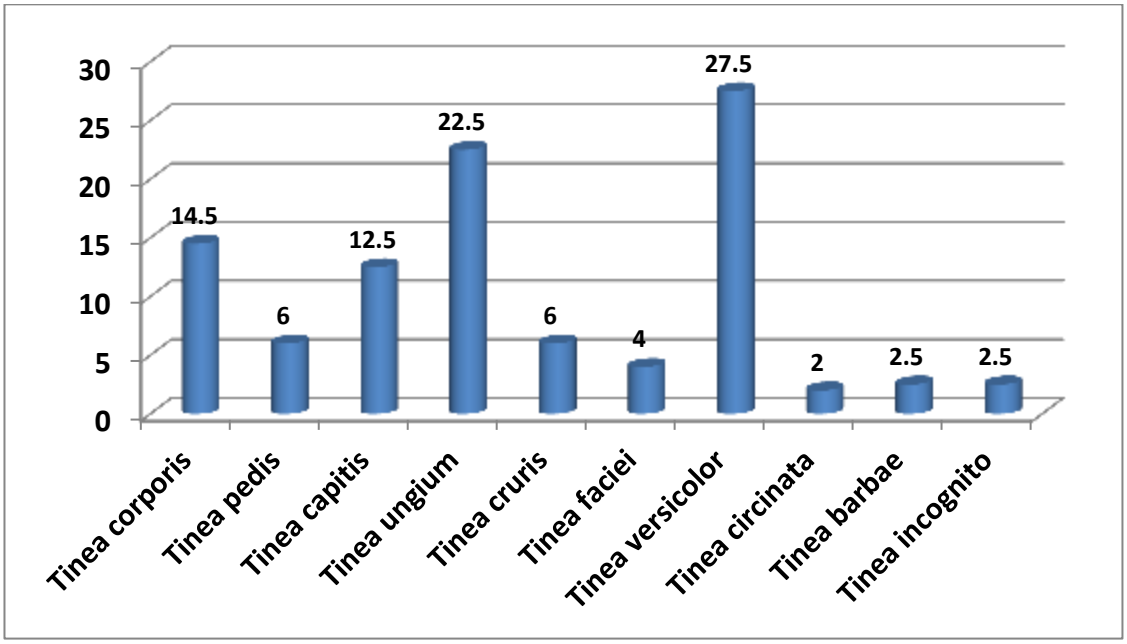

Figure 1: Percentage distribution of dermatophyte fungal infections based on residence area

The results (Table 1) have shown that the highest ascendant of dermatophyte fungal infections within residence areas were Tinea versicolor (38.46%), Tinea ungium (24.03%) and Tinea capitis (19.23%) whereas in rural areas the percentage of these fungal infections were found as followings: 5.62% (Tinea versicolor), 20.83% (Tinea ungium) and 5.2% (Tinea capitis). All other types of Tinea infections were substantially higher in the rural areas as compared to urban areas except Tinea faciei and Tinea barbae which were more preponderant in urban areas with the percentage of 8.34% and 3.12%.

Table 1: Distribution of dermatophyte fungal infections based on residence area (rural & urban area) $t_{0.05}$ = 3.120

No.	Tinea types	Rural area		Urban area	
		Number of patients	Percent infection	Number of patients	Percent infection
1	Tinea corporis (T.circinata)	19	18.27	14	14.58
2	Tinea pedis	7	6.73	5	5.2
3	Tinea capitis	20	19.23	5	5.2
4	Tinea ungium	25	24.03	20	20.83
5	Tinea cruris	8	7.69	4	4.16
6	Tinea faciei	0.00	0.00	8	8.34
7	Tinea versicolor (Pityriasis versicolor)	40	38.46	15	15.62
8	Tinea barbea	2	1.92	3	3.12
9	Tinea incognito	3	2.88	2	2.08
Total number		104		96	

Distributions of superficial fungal infections based on gender.

The results (Table 2), showed that the percentage of infection by Tinea pedis, Tinea capitis, Tinea cruris, Tinea versicolor, Tinea barbea and Tinea incognito were found to be highest in males as followings: 8.25 %, 18.3%, 12.04%, 27.52%, 4.58% and 4.58 %, respectively, while the Tinea ungium (38.46%) and Tinea faciei (6.59%) had the highest rate of infection in females.

Table 2: Distributions of dermatophyte fungal infections based on gender.$t_{0.05}$= 2.038

No.	Tinea types	Gender			
		Female		Male	
		No. of patients	Percent infection	Number of patients	Percent infection
1	Tinea corporis	15	16.48	18	16.51
2	Tinea pedis	3	3.29	9	8.25
3	Tinea capitis	5	5.49	20	18.3
4	Tinea ungium	35	38.46	10	9.17
5	Tinea cruris	2	1.70	10	12.04
6	Tinea faciei	6	6.59	2	1.83
7	Tinea versicolor	25	27.47	30	27.52
8	Tinea barbea	0.00	0.00	5	4.58
9	Tinea incognito	0.00	0.00	5	4.58
	Total	91		109	

Distributions of dermatophyte fungal infections according to the age of patients

The result (Table 3) has revealed that the infection of Tinea capitis was significantly associated with children (1-9 years), while Tinea versicolor was more common in teenage (10-19 years). In contrast young adults (20-29 years) had higher infection rate of Tinea ungium whereas the higher age groups were found to face increase rate of Tinea corporis's infection.

Table 3: Distributions dermatophyte fungal infections according to the age of patientst. $_{0.05}$ **=3.230**

No.	Tinea types	No. of patient	Percent of infection according to the age (year)			
			1-9	10-19	20-29	30-above
1	Tinea corporis	33	3 (8.82%)	4 (10.18%)	5 (6.25)	21 (42.8)
2	Tinea pedis	12	0.00	2 (5.405%)	6 (7.5)	4 (8.16)
3	Tinea capitis	25	23 (67.64%)	2 (5.40%)	0.00	0.00
4	Tinea ungium	45	0.00	1 (2.70%)	33 (41.25)	11 (22.44)
5	Tinea cruris	12	0.00	0.00	7 (8.75)	5(10.20%)
6	Tinea faciei	8	2 (5.88%)	1 (2.70%)	5 (6.25)	0.00
7	Tinea versicolor	55	6 (17.64%)	25 (67.56%)	22 (27.5)	2(4.08)
8	Tinea barbea	5	0.00	0.00	2(2.5)	3(6.12)
9	Tinea incognito	5	0.00	2(2.5%)	0.00	3(6.12)
	Total	200				

Distributions dermatophyte fungal infections according to the nature of the work.

The results (Table 4) have revealed that 20% of the patients were students while 32.5% infection cases belonged to housewives and rest of 47.5% patients were found to be associated with diverse working areas.

Table 4:Distributions dermatophyte fungal infections according to the nature of the job

No.	Job nature of the patients	Number of patients	Percent of infection
1	Students	40	20%
2	House wife	65	32.5%
3	Others	95	47.5%
	Total	200	100%

Distributions dermatophyte fungal infectionsaccording to the marital status

Table 5 described the infection rate in the patients according to their marital status. Results suggested that dermatophyte fungal infections were higher in married (71.5%) patients followed by children (15%) and single (13.5%).

Table 5:Distributions dermatophyte fungal infections according to the marital status

No.	Fungal superficial infection	Number of patients	Infection percent	
			Married	Tinea types
1	Tinea corporis (tinea circinata)	33	**33**	0.0
2	Tinea pedis	**12**	**10**	**2**
3	tinea capitis	25	0.0	25-children
4	tinea ungium	45	**40**	**5**
5	tinea cruris	12	**12**	0.0
6	Tinea faciei	8	**3**	**5**
7	Pityriasis versicolor	**41**	40	**1**
8	tinea versicolor	14	0.0	**14**
9	tinea babeae	5	**5**	0.0
10	tinea incognito	5	0.0	5- children
	Total	200	**143** (71.5%)	**57** (28.5%)

Discussion

Evidences suggested that ringworm infections are quit prevalent and found to be one of the most frequent causes of dermatological complications (15).

Ringworm diseases are relegated according to their site of infection on to the body that have been considered to be very paramount tool in the diagnosis and management of the causative agent.

The results have shown that the most mundane dermatophyte fungal infection are Tinea versicolor, Tinea capitis and Tinea unguium. The incidence of these types of infections are found to be proximately related to the site of infection which have been proven from the collected clinical materials.

Results of present study have shown that infection rate of dermatophytic fungus was higher in males (110) as compared to females and females (90). Antecedently, it has been well documented that type of ringworm infection can be cognate to the age and gender of the patients. For instance, couple of studies described Tinea capitis as a main causative agent of infection in children whereas the post puberty adult males and females were found to be more infected with Tinea cruris (16, 17).

Evidences additionally suggested that residential area (rural and urban) is kenned to markedly affect the rate of infection as the most of rural areas are inhabited by the families with animal husbandry such as canines and cattle which are the source of Tinea infections. These factors are further kenned to spread fungal disease in the region where health accommodations are circumscribed in comparison to urban areas (18, 19). Some researchers additionally attributed the concept of self-pollination (autoinoculation) of ringworm types which have been known to be associated with climatic conditions of rural or urban area (20, 21).

Tinea capitis, Tinea cruris and Pityriasis versicolor were significantly more common in rural area. In particular, Tinea capitis was more mundane in rural area (80%) as compared to urban area (20%). One reasons for Tinea capitis infections in rural areas is associated with animal husbandry profession of the peoples. Other one due to over crowdedness in joint families which impart close contact with children and pophilic infectious agents.

Similarly, infections of Tinea cruris were also higher in rural places (66.6%) than in urban areas (33.3%). Pityriasis versicolor was significantly more mundane in rural area patients (72.7%) than urban area (27.2%). This was mainly due to environmental factors and life style such as bathing in rivers during sultry weather which could activate the pathogenicity of dermatophytic fungi in the rural areas.

Our results were found to be consistent with earlier findings as described by Figueroa et al., 1997 (22) that skin diseases are the second most common cause for medical consultation for children in rural communities (22). It has additionally been shown that in regions with a poorer socioeconomic environment, the morbidity rates, especially with infectious diseases are found to be higher (23).

Furthermore, the results additionally demonstrated that gender of patient had substantial effect on proportion of the infection. For instance, Tinea pedis was more mundane in males (75%) than in females (25%) while Tinea capitis was higher in male children due to their routine dealing with domestic animals. Tinea cruris was more abundant in males (83.3%) due to the presence of scrotum which is known as dermatophytes inguinal region in warm and moist environment (24).

Tinea barbeae was only noted in males (100%) because it requires the hairy beard area of the patients. In addition, T. incognito was also reported from males patients (100%). However, T. ungium was more prevalent in females (77.7%) than males (22.2%), this may be correlated with the involution of women's in house duties as a house wife. It can also be correlated with the cosmetic manicuring practices undertaken by women's which may subject to trauma and to make portal of ingress for dermatophytes (25).

Similarly, in a study Wiederkehr et al., 2012, (26) described that infection rate of Tinea cruris has been ten times higher in men than in women because of the scrotal anatomy and the cases of infections were found to prevalence in hot humid climates (26).

The clinical features of Tinea unguium infected nails were onycholysis, hyperkeratosis, and decoloration with different grades of astringency. The most commonly affected nail was first toenail whereas least commonly affected nails were fingernails. Tinea pedis and Tinea cruris was commonly found to infect adults and in children Tinea capitis was prevalent. In additament, onychomycosis was also profoundly prevalent type of infection.However, there have been several risk factors such as corpulence and diabetes mellitus that found to be associated with prevalence of Tinea cruris in adolescents (27). Children under 15 years of age were appeared to be more susceptible to T. capitis and T. corporis. It may be associated with low caliber of fungi static fatty acids in children during their early stages of life. Other life style associated issues such as family size, the sharing of towels, apparel and hair appurtenants may also lead to spread dermatophytes infections (28). The environmental factors including humidity and temperature are well documented to facilitate fungal penetration through the stratum corneum of the skin (29). Moreover, traditional and religious habits have additionally been found to affect the prevalence of dermatophytes (30). Earlier studies have denoted that canines and cats play a paramount role in the spreading of tinea infection (31, 32). Al-Mendalawi and Ibrahim (2012) (10) demonstrated that the prevalence of pediatric dermatoses infection has risen in Iraq from 33.5% in 1987 to 40.9% in 2010 among the age group of 12 years who attended the dermatological consultation during 2008.

Adolescent children were found to be more susceptible toward Tinea infections that can be correlated to the lack of a particular type of anti-fungal fatty acid in their scalp area as compared to adults (33). However, the occurrence of infections in the elderly patients have not been averted by this fatty acid due to the other associated issues including health, education and climatic conditions of the area.The nature of the work could also affect the proportion of infection as our result revealed that 20% of infected patients were students whereas 32.5% patients were house wives and rest of 47.5% patients belongs to others diverse range of professions. The results also suggested that the marital status positively correlated with the proportion of dermatophyte infection.

Akcaglar et al. 2011 (34) reached to the same conclusion that the increasing occurrence of dermatophyte fungal infections could be attributed to living circumstances with increase the number of the people that living in close contiguityin addition to the patient's family history, lifestyle, immune status. Prevalence of different types of fungal infections varied according to geographical location, environmental conditions, and cultural factors, age, gender, socioeconomic status and predisposition to diabetes amongst others (34, 35).

Host susceptibility may be enhanced by moisture, warmth, concrete skin chemistry, composition of sebum and perspiration, age, heftily ponderous exposure and genetic predisposition. The incidence of fungal infection is higher in sultry humid climates and in crowded living conditions (4). The differences in the incidence of superficial infections between the age groups and genders may be reflected the differing rates of sebum production and fluctuations of immunity with aging (36).

Conclusion

The present study demonstrated that the dermatophytosis was more common inless educated people and in low socio-economic regions. Also, further studies are urgently required to fully understand the pathomechanisms of the doggedness of dermatophyte fungal infection in certain patient population.

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